PCAN-miniPCIe

CAN Interface for PCI Express Mini

User Manual

Document version 1.2.1 (2014-04-30)

PEAK System

Products taken into account

Product Name	Model	Part number
PCAN-miniPCIe Single Channel	One CAN channel, galvanic isolation for CAN connection	IPEH-003048
PCAN-miniPCIe Dual Channel	Two CAN channels, galvanic isolation for CAN connections	IPEH-003049

The cover picture shows the product PCAN-miniPCIe Dual Channel. The Single Channel model has an identical form factor but varies in equipment.

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1 Introduction

The PCAN-miniPCIe card enables the connection of embedded PCs and laptops with PCI Express Mini slots to CAN networks. There is galvanic isolation of up to 300 Volts between the computer and CAN sides. Device drivers and a programming interface exist for different operating systems, so programs can easily access a connected CAN bus.

Tip: At the end of this manual (Appendix C) you can find a Quick Reference with brief information about the installation and operation of the PCAN-miniPCIe card.

1.1 Properties at a Glance

- CAN interface for the PCI Express Mini slot
- CAN bus connection via connection cable and D-Sub, 9-pin (in accordance with CiA® 102)
- Bit rates from 5 kbit/s up to 1 Mbit/s
- Compliant with CAN specifications 2.0A (11-bit ID) and 2.0B (29-bit ID)
- CAN controller FPGA implementation (SJA1000 compatible)
- NXP PCA82C251 CAN transceiver
- Galvanic isolation on the CAN connection up to 300 V, separate for each CAN channel
- Space-saving dimensions thanks to SMD technology
- Extended operating temperature range of -40 to 85 °C (-40 to 185 °F)
- Single-channel or dual-channel model

Note: This manual describes the use of the PCAN-miniPCIe card with **Windows**. You can find device drivers for **Linux** and the corresponding application information on the provided DVD in the `Develop` directory branch and on our website under www.peak-system.com/linux.

1.2 System Requirements

- A vacant PCI Express Mini slot in the computer
- Operating system Windows 8, 7, Vista (32/64-bit) or Linux (32/64-bit)

1.3 Scope of Supply

- PCAN-miniPCIe card
- Connection cable including D-Sub plug for each channel
- Device drivers for Windows 8, 7, Vista and Linux (32/64-bit)
- PCAN-View CAN monitor for Windows 8, 7, Vista (32/64-bit)
- PCAN-Basic programming interface consisting of an interface DLL, examples, and header files for all common programming languages
- Manual in PDF format

2 Installing the Software and the Card

This chapter covers the software setup for the PCAN-miniPCIe card under Windows and the installation in the computer.

Setup the driver before installing the PCAN-miniPCIe card for the first time.

- Do the following to install the driver and additional software:

1. Make sure that you are logged in as user with administrator privileges (not needed for normal use of the card later on).
2. Insert the supplied DVD into the appropriate drive of the computer. Usually a navigation program appears a few moments later. If not, start the file `Intro.exe` from the root directory of the DVD.
3. On the page **English** > **Drivers** activate the entry **PCAN-PCI**.
4. Click on **Install now**. The setup program for the driver is executed.
5. Follow the instructions of the setup program.

Tip: If you do not want to install the CAN monitor PCAN-View for Windows onto the hard disk together with the driver, you have the option to start the program later directly from DVD without prior installation.

- Do the following to install the card into the computer:

Attention! Electrostatic discharge (ESD) can damage or destroy components on the PCAN-miniPCIe card. Take precautions to avoid ESD when handling the card.

1. Shut down the computer.

2. Disconnect the computer from the power supply.
3. Open the computer's casing.
4. Insert the PCAN-miniPCIe card into an empty PCI Express Mini slot. For details refer to the documentation of the computer.
5. For each CAN channel, mount a D-Sub connector with connection circuit board into a respective hole of the computer casing.
6. For each CAN channel interconnect a D-Sub connector and the corresponding port on the PCAN-miniPCIe card.

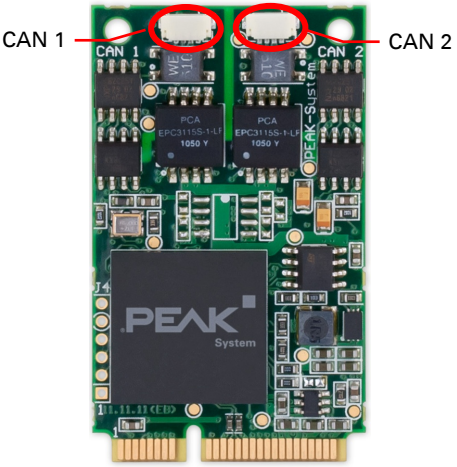

Figure 1: Positions of the CAN ports on the PCAN-miniPCIe card

7. Close the computer's casing.
8. Reconnect the power supply of the computer.

Do the following to complete the initialization:

1. Turn on the computer and start Windows. Make sure that you are logged in as user with administrator privileges.

   Windows notifies that new hardware has been detected.

2. The drivers are found and installed by Windows.
3. Afterwards you can work as user with restricted rights again.

After the driver has been successfully set up you can find the “PCAN-miniPCIe” entry in the “CAN-Hardware” branch of the Windows Device Manager.

3 Connecting the CAN Bus

3.1 D-Sub Connector

A High-speed CAN bus (ISO 11898-2) is connected to a 9-pin D-Sub connector. The pin assignment for CAN corresponds to the specification CiA® 102.

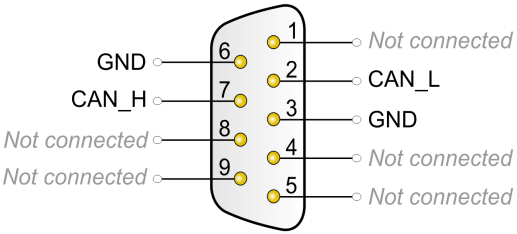

Figure 2: Pin assignment High-speed CAN
(view onto a D-Sub connector)

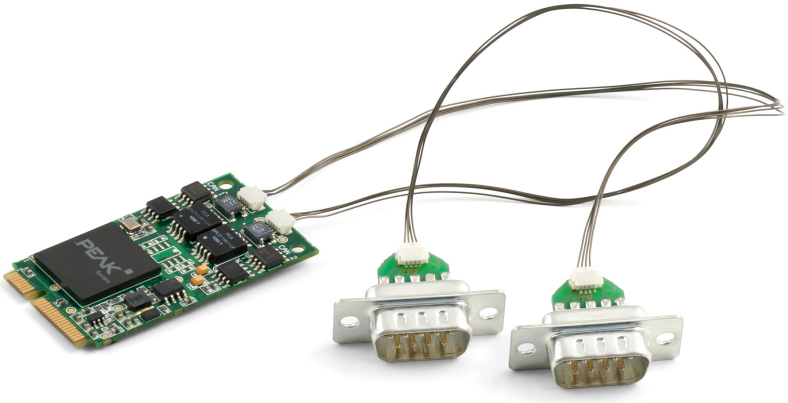

Figure 3: PCAN-miniPCIe card with connection cables

To connect a CAN bus to the PCAN-miniPCIe card, use the supplied special connection cables. After you've plugged in the cable on the PCAN-miniPCIe card, you can connect a CAN bus to the D-sub socket.

The pin assignment between the D-Sub port and the 4-pin connector[1] on the PCAN-miniPCIe card is as follows:

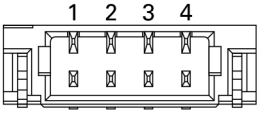

Figure 4: Front view of a CAN connector (SUR) on the PCAN-miniPCIe card (CAN 1, CAN 2)

Pin SUR	Function	Pin D-Sub
1	Not used	1
2	GND	3, 6
3	CAN_H	7
4	CAN_L	2

[1] Connector type SUR from JST (www.jst-mfg.com), name of the matching plug: 04SUR-32S

3.2 Cabling

3.2.1 Termination

A High-speed CAN bus (ISO 11898-2) must be terminated on both ends with 120 Ohms. Otherwise, there are interfering signal reflections and the transceivers of the connected CAN nodes (CAN interface, control unit) do not work.

The PCAN-miniPCIe card does not have an internal termination. Use the adapter on a terminated CAN bus.

3.2.2 Example of a Connection

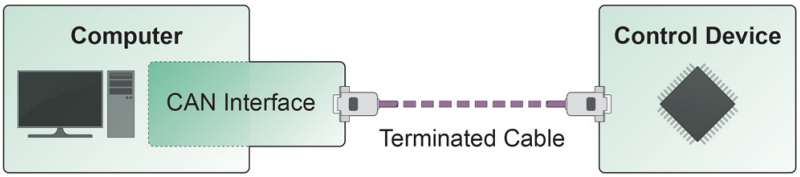

Figure 5: Simple CAN connection

In this example, the PCAN-miniPCIe card is connected with a control unit by a cable that is terminated at both ends.

3.2.3 Maximum Bus Length

High-speed CAN networks may have bit rates of up to 1 Mbit/s. The maximum bus length is primarily depending on the bit rate.

The following table shows the maximum CAN bus length at different bit rates:

Bit rate	Bus length
1 Mbit/s	40 m
500 kbit/s	110 m
250 kbit/s	240 m
125 kbit/s	500 m
50 kbit/s	1.3 km
20 kbit/s	3.3 km
10 kbit/s	6.6 km
5 kbit/s	13.0 km

The listed values have been calculated on the basis of an idealized system and can differ from reality.

4 Using the Software

This chapter covers the provided software PCAN-View and the programming interface PCAN-Basic.

4.1 CAN Monitor PCAN-View for Windows

PCAN-View for Windows is a simple CAN monitor for viewing, transmitting, and logging CAN messages.

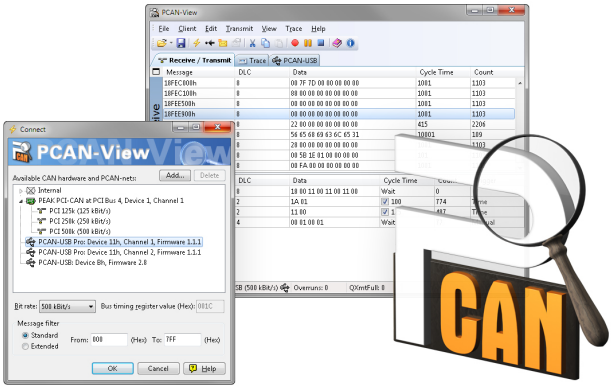

Figure 6: PCAN-View for Windows

- Do the following to start and initialize PCAN-View:

  1. If PCAN-View is already installed on the hard disk, open the Windows Start menu, go to **Programs** > **PCAN-Hardware**, and select the entry **PCAN-View**.

If you haven't installed PCAN-View together with the device driver, you can start the program directly from the supplied DVD. In the DVD navigation program (`Intro.exe`), go to **English** > **Tools**, and under **PCAN-View for Windows** select the **Start** link.

The dialog box for selecting the CAN hardware and for setting the CAN parameters appears.

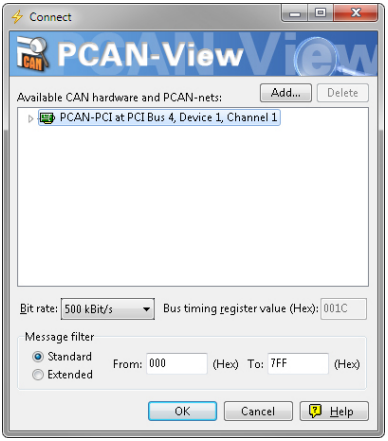

Figure 7: Selection of the CAN specific hardware and parameters

2. From the list **Available CAN hardware** select the CAN channel to be used.
3. Select the **Bit rate** that is used by all nodes on the CAN bus.
4. Under **Filter settings** you can limit the range of CAN IDs to be received, either for standard frames (11-bit IDs) or for extended frames (29-bit IDs).
5. Finally confirm the settings in the dialog box with **OK**. The main window of PCAN-View appears (see Figure 8).

4.1.1 Receive/Transmit Tab

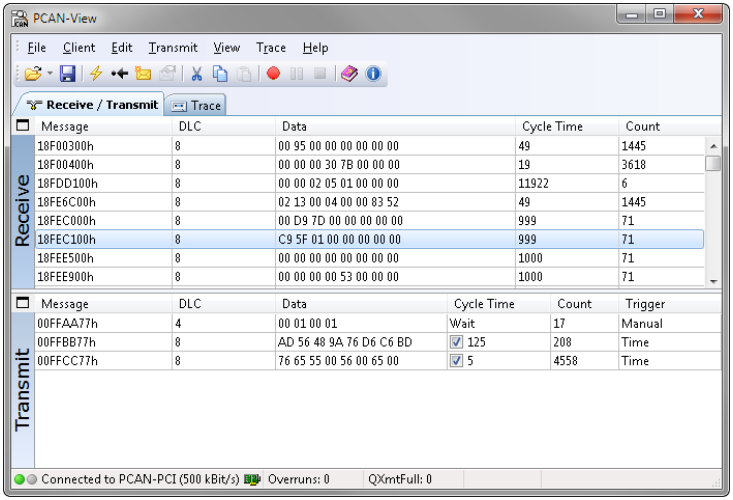

Figure 8: Receive/Transmit tab

The Receive/Transmit tab is the main element of PCAN-View. It contains two lists, one for received messages and one for the transmit messages. Representation of CAN data is in hexadecimal format.

Do the following to transmit a CAN message with PCAN-View:

1. Select the menu command **Transmit** > **New Message** (alternatively or Ins).

   The dialog box **New Transmit Message** is shown.

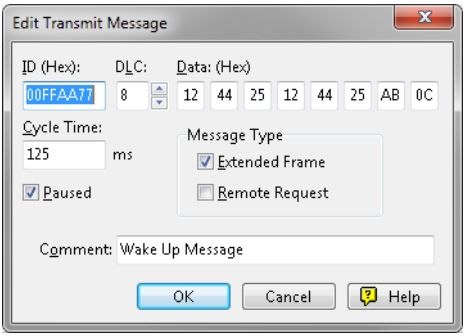

Figure 9: Dialog box New transmit message

2. Enter the ID and the data for the new CAN message.
3. The **Cycle Time** field indicates if the message will be transmitted manually or periodically. If you want to transmit the message periodically, you must enter a value greater than 0. For a manual-only transmission enter 0.
4. Confirm the entries with **OK**.

   The created transmit message appears on the **Receive/Transmit** tab.
5. You trigger selected transmit messages manually with the menu command **Transmit** > **Send** (alternatively Space bar). The manual transmission for CAN messages being transmitted periodically is carried out additionally.

Tip: Using the menu command **File** > **Save**, you can save the current transmit messages to a list and reload them later on.

4.1.2 Trace Tab

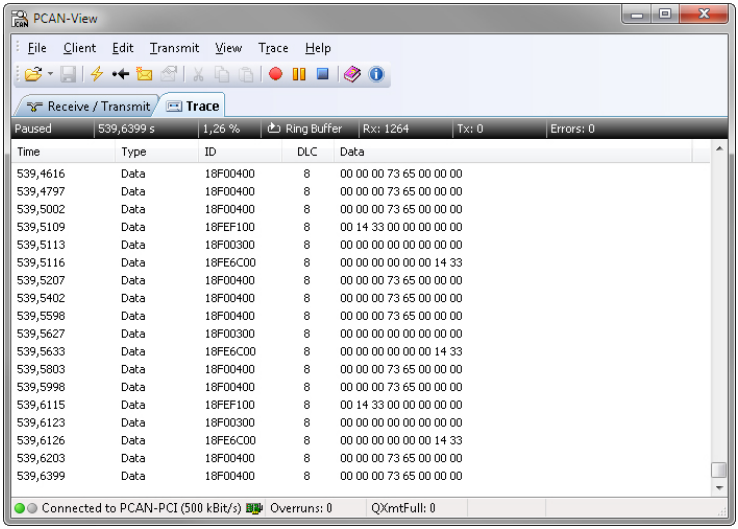

Figure 10: Trace tab

On the Trace tab the data tracer of PCAN-View is used for logging the communication on a CAN bus. During this process the CAN messages are cached in the working memory of the PC. Afterwards they can be saved to a file.

The tracer can be configured to run in linear or in ring buffer mode. In linear buffer mode the logging is stopped as soon as the buffer is filled completely. In ring buffer mode the oldest messages are overwritten by incoming ones.

4.1.3 Status Bar

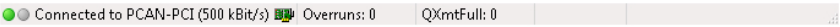

Figure 11: Example of the status bar

The status bar shows information about the current CAN connection, about error counters (Overruns, QXmtFull), and error messages.

You can find further information about the use of PCAN-View in the help which you can invoke in the program via the **Help** menu or with the F1 key.

4.2 Linking Own Programs with PCAN-Basic

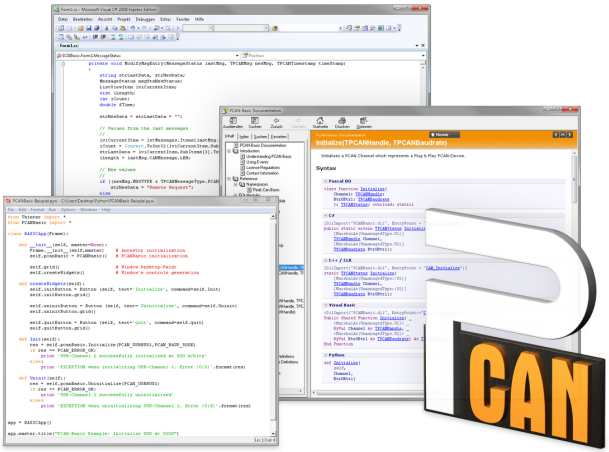

Figure 12: PCAN-Basic

On the provided DVD you can find files of the programming interface PCAN-Basic in the `Develop` directory branch. This API provides basic functions for linking own programs to CAN interfaces by PEAK-System and can be used for the following operating systems:

- Windows 8, 7, Vista (32/64-bit)
- Windows CE 6.x (x86/ARMv4)
- Linux (32/64-bit)

The API is designed for cross-platform use. Therefore, software projects can easily ported between platforms with low efforts. PEAK-System has created examples for the following programming languages: C++, C#, C++/CLR, Visual Basic, Delphi, Python, and Java.

4.2.1 Features of PCAN-Basic

- Supports Windows 8, 7, Vista (32/64-bit), Windows CE 6.x, and Linux (32/64-bit) operating systems
- Multiple PEAK-System applications and your own can be operated on a physical CAN channel at the same time
- Use of a single DLL for all supported hardware types
- Use of up to 8 channels for each hardware unit (depending on the PEAK CAN interface used)
- Simple switching between channels of a PEAK CAN interface
- Driver-internal buffer for 32768 messages per CAN channel
- Precision of time stamps on received messages up to 1 µs (depending on the PEAK CAN interface used)
- Access to specific hardware parameters, such as listen-only mode
- Notification of the application through Windows events when a message is received
- Extended system for debugging operations
- Multilingual debugging output
- Output language depends on operating system
- Debugging information can be defined individually

An overview of the API functions is located in the header files. You can find detailed information about the PCAN-Basic API on the provided DVD in the text and help files (file name extensions `.txt` and `.chm`).

4.2.2 Principle Description of the API

The PCAN-Basic API is the interface between the user application and device driver. In Windows operating systems this is a DLL (Dynamic Link Library).

The sequence of accessing the CAN interface is divided into three phases:

1. Initialization
2. Interaction
3. Completion

Initialization

A CAN channel must be initialized before using it. This is done by the simple call of the function `CAN_Initialize`. Depending on the type of the CAN hardware, up to eight CAN channels can be opened at the same time. After a successful initialization the CAN channel is ready for communication with the CAN hardware and the CAN bus. No further configuration steps are required.

Interaction

For receiving and transmitting CAN messages the functions `CAN_Read` and `CAN_Write` are available. Additional settings can be made, e.g. setting up message filters to confine to specific CAN IDs or setting the CAN controller to listen-only mode.

When receiving CAN messages, events are used for an automatic notification of an application (client). This offers the following advantages:

- The application no longer needs to check for received messages periodically (no polling).
- The response time at reception is reduced.

Completion

To end the communication the function `CAN_Uninitialize` is called in order to release the reserved resources for the CAN channel, among others. In addition the CAN channel is marked as "Free" and is available to other applications.

4.2.3 Notes about the License

Device drivers, the interface DLL, and further files needed for linking are property of the PEAK-System Technik GmbH and may be used only in connection with a hardware component purchased from PEAK-System or one of its partners. If a CAN hardware component of third-party suppliers should be compatible to one of PEAK-System, then you are not allowed to use or to pass on the driver software of PEAK-System.

If a third-party supplier develops software based on the PCAN-Basic and problems occur during the use of this software, consult the software provider.

5 Technical Specifications

Connectors	
Computer	PCI Express Mini slot, 52-pin; electromechanical specifications 1.1 and 1.2
CAN (via cable)	D-Sub (m), 9-pin, assignment according to specification CiA® 102
CAN (on card)	Connector type SUR from JST (www.jst-mfg.com), name of the matching plug: 04SUR-32S

CAN	
Specification	ISO 11898-2, High-speed CAN 2.0A (Standard format) and 2.0B (Extended format)
Bit rates	5 kbit/s - 1 Mbit/s
Controller	FPGA implementation (SJA1000 compatible)
Transceiver	NXP PCA82C251
Galvanic isolation	up to 300 V (separate for each CAN connector)
Termination	none

Power supply	
Supply voltage	1.5 V and 3.3 V
Current consumption	1.5 V: max. 180 mA 3.3 V: max. 330 mA

Measures	
Size	30 x 51 x 4 mm (W x L x H) See also dimension drawing in Appendix B on page 26.
Weight	Card: max. 7 g Cable + D-Sub: max. 16 g
Length connection cable (card - D-Sub)	20 cm, other cable lengths on request

Continued on the next page

Environment	
Operating temperature	-40 - 85 °C (-40 - 185 °F)
Temperature for storage and transport	-40 - 100 °C (-40 - 212 °F)
Relative humidity	15 - 90 %, not condensing
EMC	EN 55024:2011-09 EN 55022:2011-12 EC directive 2004/108/EG

Appendix A CE Certificate

PCAN-miniPCIe IPEH-003048/49 – EC Declaration of Conformity
PEAK-System Technik GmbH

Notes on the CE Symbol CE

The following applies to the "PCAN-miniPCIe" product with the item number(s) IPEH-003048/49.

EC Directive This product fulfills the requirements of EU EMC Directive 2004/108/EG (Electromagnetic Compatibility) and is designed for the following fields of application as for the CE marking:

Electromagnetic Immunity
DIN EN 55024, publication date 2011-09
Information technology equipment – Immunity characteristics – Limits and methods of measurement (CISPR 24:2010);
German version EN 55024:2010

Electromagnetic Emission
DIN EN 55022, publication date 2011-12
Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (CISPR 22:2008, modified);
German version EN 55022:2010

Declarations of Conformity In accordance with the above mentioned EU directives, the EC declarations of conformity and the associated documentation are held at the disposal of the competent authorities at the address below:

PEAK-System Technik GmbH
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64293 Darmstadt
Germany

Phone: +49 (0)6151 8173-20
Fax: +49 (0)6151 8173-29
E-mail: info@peak-system.com

Signed this 22nd day of October 2013

Appendix B Dimension Drawing

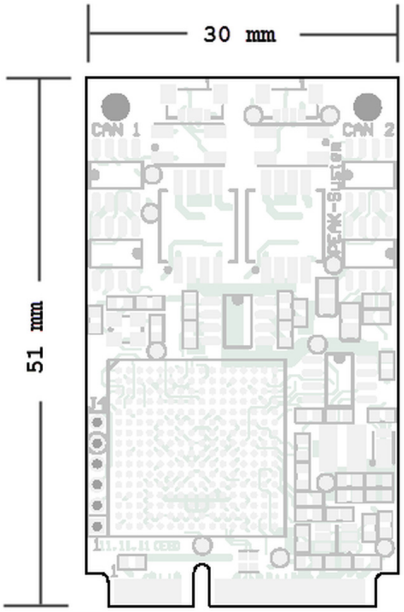

Figure 13: View PCAN-miniPCIe

The figure does not show the actual size of the product.

Appendix C Quick Reference

Software/Hardware Installation under Windows

Before installing the PCAN-miniPCIe card into the computer please set up the corresponding software package from the supplied DVD (with administrator privileges). Afterwards, insert the PCAN-miniPCIe card into a vacant PCI Express Mini slot of the switched off (de-energized) computer. At the next start of Windows the PCAN-miniPCIe card is recognized by Windows and the driver is initialized. After the driver has been successfully installed, you can find the "PCAN-miniPCIe" entry in the "CAN-Hardware" branch of the Windows Device Manager.

Getting Started under Windows

Run the CAN monitor PCAN-View from the Windows Start menu as a sample application for accessing the PCAN-miniPCIe card. For initialization of the PCAN-miniPCIe card, select the CAN connection and the CAN bit rate.

High-speed CAN connector (D-Sub, 9 pins)